A STUDY OF THE NATURE OF THE DIFFERENCES BETWEEN TWO LINES OF SWINE SELECTED FOR RAPID AND SLOW GROWTH RATES

BY

HAROLD JOHN SMITH

B. S., Oklahoma Agricultural and Mechanical College, 1940

M. S., University of Illinois, 1941

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ANIMAL SCIENCE IN THE GRADUATE SCHOOL OF THE UNIVERSITY OF ILLINOIS, 1947

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A Study of the Nature of the Differences Between Two Lines of Swine Selected For Rapid and Slow Growth Rates

Selection is an effective tool in the hands of the capable animal breeder in improving the performance of animals. Complicated physiological characters such as rate of gain, economy of gain, milk production, egg production, vigor, and fertility, which are undoubtedly dependent for their maximum expression upon a multiplicity of genes, present an intricate problem for the breeder whose objective is to improve the genetic quality of his animals in several characters simultaneously. The problem is also complicated by the correlation which may exist among the genes involved in the production of desirable characters. An understanding of the nature of differences between lines or strains derived by selection in opposite directions from the same foundation stock may give some insight into some of the problems confronting the breeder.

Data from two lines of Hampshire swine, one of which has been selected for rapid growth rate for seven generations and the other for slow growth rate for six generations, were studied for possible differences. Both rapid and slow-growing lines were selected from the same foundation stock consisting of 41 Hampshire boars and 42 Hampshire sows purchased as weanlings from 48 Illinois Hampshire herds. From this population the five boars and fifteen gilts which gained most rapidly, as determined by weight at 180 days, were selected as foundation animals of the rapid-growing line. The slowest gaining five boars and fifteen gilts comprised the foundation stock of the slow-growing line. The lines have been carried as closed herds since the initial selection and inbreeding kept at a minimum by saving only one boar from a litter and mating him to gilts least related to him. Weight at 180 days has been the basis of selection.

Summary and Conclusions

Mean 180-day weights of males and females were determined for each line and for each generation of each line. A study of these weights showed that growth rate was not significantly influenced by sex in either line.

Variability in growth rate in the two lines was analyzed by the coefficients of variability. Variation was determined for each generation

of each line for weights at birth, 21, 56, 150 and 180 days. Significance of the changes in variability was determined from the best fitting straight lines. Variability in weights at birth, 21, and 56 days remained approximately the same in both lines without significant change in either direction. For weights at 150 and 180 days, variability increased significantly in both the rapid and slow-growing lines. Differences in variability between the two lines were not significant at any age.

The comparative efficiency of feed utilization between the two lines was studied by paired and group-feeding technics Sixteen pairs of pigs were fed keeping the daily feed consumption the same for the two members of a pair. Five rapid-line and eight slow-line litters were fed as litters in individual ⅛ acre lots for a period of 70 days beginning when the pigs were weaned at 56 days. No difference in efficiency of feed utilization was found in the paired-feeding tests, while in the group-feeding tests a significantly greater efficiency of feed utilization was obtained in the rapid line. The paired-feeding tests were made in small lots (448 sq. ft.) while the group-feeding tests were carried on in larger lots (5445 sq. ft.). The slow-line pigs were apparently more active in the larger lots. A reduction in activity of the slow-line pigs confined to smaller lots is suggested to account for the differences in the two tests.

Average litter size in both the rapid and slow-growing lines decreased significantly during the period of selection but the difference in litter size between the two lines was not significant.

The sex ratio of 108 males per 100 females in the rapid line does not represent a significant departure from parity, but a sex ratio of 121.7 males per 100 females in the slow line is a significant deviation from parity.

Mortality, expressed as a percentage of pigs dead at birth, 21, 56, 150, and 180 days, was approximately the same in the two lines.

Vita

The author was born December 21, 1919, at Verden, Oklahoma. He was graduated from Verden High School in 1936 and entered Oklahoma Agricultural and Mechanical College the same year. He obtained the B.S. degree in Agriculture and was graduated with special distinction from that institution in 1940. In September 1940, the writer came to the University of Illinois on a fellowship in the Division of Animal Genetics. The M.S. degree was obtained in June 1941. In July 1942, he enlisted in the U. S. Naval Air corps and served as a Naval Aviator until his release in December 1945. In February 1946, he returned to the University of Illinois as an assistant in Animal Husbandry in the Division of Animal Genetics.

The writer is a member of Sigma Xi, Phi Sigma, Phi Kappa Phi, Gamma Sigma Delta, Alpha Zeta, Gamma Alpha and the American Society of Animal Production.

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